

Serial No. 09/895,152
Reply to Office Action dated October 7, 2005

Docket No. MEMS-0160-US

REMARKS/ARGUMENTS

Favorable reconsideration and allowance of the present patent application are respectfully requested in view of the foregoing amendments and the following remarks. Claims 1-4, 6-25, 27-28 and 36-42 are pending in the application.

35 U.S.C. § 102 & 103 Rejections

Claims 1-4, 6-25, 27-28 and 36-42 were rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Feldman et al., "Feldman" (U.S. Patent No. 6,071,652). Applicant respectfully traverses each of these rejections for at least the following reasons.

Regarding claim 1, the Examiner alleges that the Feldman patent anticipates Applicant's claim. Specifically, the Examiner alleges that abstract, col. 4, lines 25-58 and 8a of Fig. 1b of Feldman shows the identical invention as required under 35 U.S.C. § 102(e). In contrast to the Examiner's interpretation the Feldman recites the following in 4, lines 25-58 (with emphasis added).

FIG. 1a illustrates a structure that may be processed into a gray scale mask in accordance with the present invention. This structure includes a transparent substrate 6, a layer 8 of a material whose absorption of radiation, typically in the ultraviolet region, increases with the thickness thereof, such as metal or amorphous silica, and a photoresist layer 10. The terms transmissive and absorbing refer to the wavelength used during photoresist exposure using the mask, discussed in detail below.

A desired pattern is produced, in accordance with the present invention, in the photoresist layer 10 in accordance with techniques previously used for making diffractive optical elements in resist. Such techniques include creating a continuous diffractive optical element using direct writing with a laser or a multiple discrete level binary optics using plural binary masks. The pattern in the photoresist layer 10 is then transferred to the layer 8 of absorptive material. This can be achieved through ion-milling, reactive ion etching, chemical etching, or other techniques.

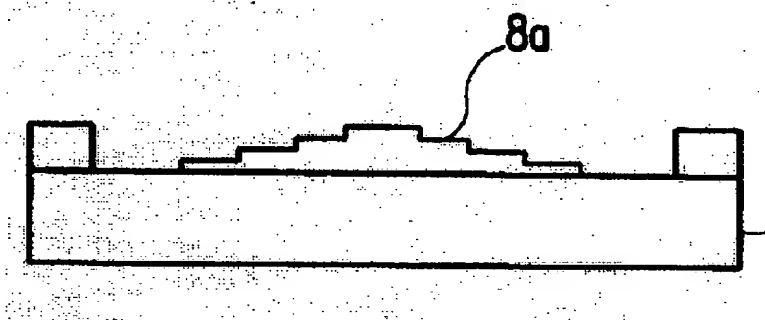
The gray scale mask of the present invention may be formed by patterning the photoresist layer 10 with a first mask, transferring this pattern into the absorptive material 8, depositing another photoresist layer, patterning this layer with a second mask, transferring this pattern into the absorptive material, until the desired number of levels is reached. Alternately, the gray scale mask of the present invention may be made using deposition lift off in which the photoresist is first deposited on the substrate 6, the photoresist layer 10 is then patterned with a first mask, the material layer 8 is then deposited on the patterned photoresist layer 10. The photoresist layer 10 is then

Serial No. 09/895,152

Docket No. MEMS-0160-USReply to Office Action dated October 7, 2005

dissolved, lifting off material layer 8 where the material layer is deposited over the photoresist, leaving the material in the other regions. Another photoresist layer is then added over the remaining material and patterned with a second mask. Another material layer is then deposited on the photoresist layer patterned with the second mask. This process is repeated until the desired number of levels is formed.

Additionally, when this section is taken in conjunction with the cited Fig 1b, reference 8a (illustrated below), it is clear that Feldman teaches to write multiple passes along the same path, in contradiction to the Examiner's interpretation.



Specifically, as can be seen from the illustration above showing the stepped levels and the related description (i.e., multiple masks are used to create the multiple levels), it is clear that Feldman teaches to overlay masks to that would "write" on the exact same areas to create the stepped levels that are illustrated.

Regarding claim 8, Applicant respectfully submits that "reflow" process taught in Feldman and relied upon by the Examiner is expressly taught away from in Applicant's disclosure (see, e.g. par. 0036 cited below with emphasis added).

[0036] There are several techniques to accomplish the heating process solution; the appropriate technique may depend on the initial surface structure. The different techniques include at least (1) baking the photosensitive material for a specific amount of time; (2) placing the wafer upside down so that the photosensitive material is a short distance, e.g. a few millimeters or greater, from a heat source such as a hot plate, thermoelectric element, infrared lamp or a thermal bath; (3) using a heat gun to blow hot air onto the photosensitive surface; (4) flowing a hot liquid over the surface of the photosensitive material; and (5) flowing a hot solvent vapor over the surface of the photosensitive material. The objective in practicing this solution is to not melt or reflow the bulk of the photosensitive material but rather to smooth surface irregularities without changing surface contour.

Serial No. 09/895,152

Docket No. MEMS-0160-USReply to Office Action dated October 7, 2005

The Examiner indicates that Feldman allegedly shows a reflow in the photoresist (melting) to eliminate roughness, wherein the reflow (melting of the photoresist) is performed to eliminate obvious discontinuities. However, Feldman in actuality states (emphasis added):

When forming a refractive element using a gray scale mask that does not itself have a continuous profile, such as the gray scale mask formed in accordance with the present invention, it may be desirable to reflow the photoresist before the final step 38 of forming the element. This reflow would involve only heating the photoresist up by a small amount such that any obvious discontinuities arising from the step wise nature of the gray scale mask will be eliminated (Feldman et al., col. 8, ll. 7-14).

As clearly stated in Feldman, the reflow process is used to eliminate "obvious discontinuities arising from the step wise nature of gray scale mask." Feldman fails to show, suggest, or teach reducing general roughness error. Claim 8 states: "melting at least a portion of the photosensitive material, whereby general roughness error is reduced". As noted in Applicant's specification in paragraph 14, the general roughness error is "caused by the slight variations in the dose of the writing tool, usually an electron beam (e-beam) or laser. In the case of the half tone process, the chosen pixel shape scheme may cause this error. The period of oscillation for the general roughness error is typically on the order of 10 microns."0

Accordingly, Applicant respectfully submits that Feldman does not teach the identical invention as claimed and does not anticipate Applicant's claimed combinations as alleged.

As stated in MPEP § 2131, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as

Serial No. 09/895,152
Reply to Office Action dated October 7, 2005

Docket No. MEMS-0160-US

is contained in the ...claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The Feldman reference applied by the Examiner neither expressly nor inherently describes every feature of Applicant's claimed combinations as detailed in the foregoing arguments. Therefore, Applicant respectfully submits that the applied references do not anticipate Applicant's claimed combinations as alleged by the Examiner.

The remaining independent claims (i.e., claims 23 and 36) recite related subject matter to the above-identified independent claims, and are therefore allowable for reasons similar to those given above.

The dependent claims are allowable at least by virtue of their dependency on the above-identified independent claims. See MPEP § 2143.01. Moreover, these claims recite additional subject matter, which is not suggested by the documents taken either alone or in combination. For instance, claim 42 recites "wherein a depth of melting is determined as the root mean square of roughness of the surface layer", which is not taught or suggested by the Feldman patent. Accordingly, Applicant respectfully requests withdrawal of the outstanding rejections and allowance of the pending claims.

CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney, at the telephone number listed below.

Serial No. 09/895,152
Reply to Office Action dated October 7, 2005

Docket No. MEMS-0160-US

Deposit Account

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 50-3136 and please credit any excess fees to such deposit account.

Respectfully submitted,



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Date: February 7, 2006

Attachment(s):